Water Mist is a form of active fire protection that, like all extinguishing technologies, can be effective in the protection of certain, but not all risks.

The questions herein are intended to elicit information that could be useful in providing evidence of the "equivalence" of such systems to alternative fixed firefighting systems and their associated published and recognised standards.

It is recommended that one of these forms be completed for each risk to be protected by water mist system(s). This form is to be used to capture and record some of the data required to support a reasonable claim of "equivalence" and to provide evidence of sound engineering practice. In Fire Engineering Documents 'equivalency' must be demonstrated BOTH in terms of firefighting capability AND reliability.

Do not use this form for local application systems, or building compartment protection systems of the 'deluge' open-head type (separate forms are available for these systems, IQ 2 and IQ 1, respectively).

Form: IQ 3

Version 4.0 April 2020

IQ 3

Water Mist Questionnaire: Building Compartment Protection – Systems incorporating 'thermally-actuated' closed heads

To be completed at the design and proposal stage of suppression system planning

Issued by: Ins. Co./Trade Ass/AHJ name in here

DOCUMENT SCOPE: Building Compartment Protection – Systems incorporating thermally actuated closed heads

For the purposes of this exercise 'Building Compartment Protection – Systems incorporating thermally actuated closed heads' refers to installations protecting building compartments to their boundaries with closed-head thermally actuated 'bulbed' spray heads arranged to protect the compartment in its entirety. Systems using 'zoning' within compartments are excluded.

NOTE: COMPLETION GUIDANCE NOTES

Completion of this form neither guarantees system performance nor system acceptance by the issuer. It is strongly recommended that each completed form and supporting data be reviewed by an independent expert.

RISCAuthority

IMPORTANT NOTICE

This document has been developed through the RISCAuthority and published by the Fire Protection Association (FPA). RISCAuthority membership comprises a group of UK insurers that actively support a number of expert working groups developing and promulgating best practice for the protection of people, property, business and the environment from loss due to fire and other risks. The technical expertise for this document has been provided by the Technical Directorate of the FPA, external consultants, and experts from the insurance industry who together form the various RISCAuthority Working Groups. Although produced with insurer input it does not (and is not intended to) represent a pan-insurer perspective. Individual insurance companies will have their own requirements which may be different from or not reflected in the content of this document.

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COMPLETION GUIDANCE NOTES:

This questionnaire is designed to elicit technical information required to underpin a satisfactory fire protection system design. As such, it covers many areas of system design. To avoid confusion as to what information is required at each question, it is suggested that the questionnaire is read in its entirety prior to commencing completion.

Where multiple discrete suppression systems are proposed it will simplify the process of completing the questionnaire, to complete a separate questionnaire for each system.

In all cases, if insufficient space is provided to answer the questions in the questionnaire, continue on separate sheets. If separate sheets are used, indicate this is the case and record the document number, title, issue number and date at the location of the question.

IMPORTANT NOTE

Failure to be able to provide answers to any of the questions might demonstrate there to be a shortfall in the knowledge and evidence that FPA / RISCAuthority consider to be appropriate to the implementation of a quality suppression / extinguishing system.

Scoring matrix for completion by Insurer / Trade Association or AHJ

The Table below is for completion by the Insurer / Trade Association or AHJ and NOT by those proposing or designing the watermist system. The matrix is made visible to ensure those completing the form to assist them understand in advance the key elements considered fundamental to the delivery of a quality watermist systems.

Questions – For the risks described:	Answer
1. Is watermist, as described in this completed form, the ideal suppression technology to use?	Yes / No
2. Are the extent of coverage and maximum area(s) of operation appropriate to the fire threat(s)?	Yes / No
3. Are the referenced standards, approvals, and third-party bodies appropriate to this protection scenario?	Yes / No
4. Where required in fire engineered solutions, has 'equivalency' for BOTH Performance (ability to put out fire) and Reliability (ability to actuate and perform optimally upon a fire starting over time) been demonstrated against i.e. a BS Sprinkler System.	Yes / No
5. Does the fire test evidence provided adequately ensure system capability in terms of the risk (realistic of the protection scenario), scale, detection method, ceiling height, fuels, ventilation etc.?	Yes / No
6. Where actuation is by thermally-sensitive bulb – has the test evidence been produced on the same basis and at the same scale (height and area)?	Yes / No
7. Has sufficient test evidence been submitted to demonstrate that in a 6 x 6 grid of nozzles with representative fire conditions (a) head skipping does not occur, and (b) the timeliness of further nozzle actuation is not impaired by the gas cooling afforded by prior nozzle activation.	Yes / No
8. With reference to 4 – has due consideration been given to all operating modes of the equipment or compartment (i.e. normal, in maintenance, in cleaning, fault, dirty (grease build up etc.) temporary / backlog storage etc.) to ensure system 100% viability?	Yes / No
9. Is the detection method and equipment appropriate to ensuring the system actuates before the fire grows to a size that might be 'unmanageable' or result in excessive damage?	Yes / No
10. Are the interlocks with fuel, ventilation, conveyancing etc. appropriate to ensuring the system has the best opportunity to function correctly?	Yes / No

11. Have sufficient measures been taken to mitigate single-point failure modes?	Yes / No
12. Are water supplies adequate in terms of duration, resilience, and protection from freezing?	Yes / No
13. Have sufficient measures been taken to ensure watermist heads will not block either by particulate contamination, corrosion, mineral deposit, or foreign coating?	Yes / No
14. Are all components of the system approved by a 3rd party certifying body?	Yes / No
15. Is the 'performance objective' of the system correctly assessed together with an appreciation of any follow-on actions required to satisfactorily bring the fire threat to a conclusion?	Yes / No
16. Where the performance objective is 'suppression' or 'control' rather than extinguishment – are procedures to ensure necessary follow-on actions occur robust?	Yes / No
17. Where manual operation of the system is an option have appropriate instructions been given to the end-user and are means in place (training and signage) to ensure this is appropriately communicated?	Yes / No
18. Is the hydraulic design correct and is the effective duration correctly calculated for the least hydraulically favourable head?	Yes / No
19. Have roles and responsibilities for all decisions of design and installation of the system been correctly identified?	Yes / No
20. Is the 3-year watermist head function test period understood and programmed into the system's maintenance schedule	Yes / No
21. In the event that the system manufacturer has ceased trading, has the resupply of parts that might need replacing (following system operation, damage, or failed test) that are specific to the certification of the system (such as the watermist heads [3-years]) been considered and a plan for this eventuality made?	Yes / No

Contents

Terminology

The following terms may be used on an interchangeable basis:

- Water mist head / Nozzle
- Building compartment / Compartment / Room

1. Location
1a. Full address(s) of premises with risk(s) to be protected:

2. Roles and responsibilities – System design		
2a. Entity responsible for the design of the water mist system	Company or organisation's name	
	Responsible person's name & job title	
	Company or organisation's Address	

3. Roles and responsibilities – System Installation		
3a. Entity responsible for the installation of the water mist system (if different to question 2a above)	Company or organisation's name	
	Responsible person's name & job title	
	Company or organisation's Address	

4. Description of the water supply		
Water source: (please tick)	Town main	
	Stored water	
	Stored water relying on infill	
Stored water volume (if applicable)		dm^3
Infill rate (if applicable)		dm^3/min
Date and time of infill pressure and flow rate test:		
Results of infill pressure and flow rate test:		
Flow rate		dm^3/min
Flowing pressure		Bar
System water supply pressure at commencement of discharge:		Bar
System water supply pressure at end of effective discharge[1]:		Bar
Give details of water supply quality and any special treatment required (e.g. potable water, filtered water, de-mineralised water, or any other requirements):		
Give full details of any water additives required and proportioning method or devices (composition, MSDS, required concentration, shelf life, approvals, disposal, etc.):		
Provide details of any required energy source for water supplies: Where electrical power supplies are used reference (drawing number, title, date, issue number) the circuit diagrams provided which identify sources, interdependencies and all isolation means:		

[1] Pressure at end of effective discharge – The minimum pressure below which the least hydraulically favourable nozzle will no longer supply extinguishing media at a rate that will meet the performance objective as outlined in 14; as proven by supporting experimental fire tests detailed in 17.

Identify all water supply connections, for fire protection or other purposes, which may draw water from the supply and how the demands are managed: If the water supply is connected other water mist systems provide details of how the water supplies are managed and how compartment protection systems can be supported in simultaneous operation:
Are freezing conditions ever likely to occur that could affect the water mist protection system? Is the user aware of the need to prevent the equipment experiencing conditions where freezing of firefighting media could occur? How is this to be communication to them?

5. Water mist component supplier(s)
5a. Give the name and address of the water mist component supplier(s):

6. Water mist component details for critical and key components	
Note: System Installation Standards and approvals are dealt with at 17.	
Component (Make / Model)	Approval details (standard and 3rd party certifying body)
Pumps:	
Water storage cisterns or vessels:	
Additives:	
Compressed gas supplies:	
Valves:	
Actuators:	
Pipework and fitting (include details of materials of construction):	
Pipe fixings:	
Nozzles (closed-head, thermally actuated) – give details at 7	
Fire detection:	
Alarms:	
Other components critical to system function (not already detailed in this section or section 11):	

7. Nozzles / Watermist Heads		
7a. Type of nozzles: (please tick)	Thermally-actuated closed head – Standard	
	Recessed thermally-actuated closed head	
	Hidden thermally-actuated closed head	
	If using 'open' nozzles please use form IQ 1 or IQ 2 in place of this form.	
7b. Do all of the nozzles used on the system have identical hydraulic and distribution characteristics?		Yes / No
7c. List the nozzle k factors used with their associated RTI and temperature rating:		
7d. Record the smallest cross-sectional area found in any nozzle water way: Calculate the diameter of the largest sphere that will pass through the waterway and its cross sectional area:		
7e. Record the number of nozzles present on the system:		
7f. Record the maximum number of nozzles that will discharge water during operation in a fire:		
7g. If the system protects a number of compartments, give details of the number of nozzles per compartment, and the maximum number of compartments expected to require protection simultaneously (nozzles per compartment, number(s) of compartments requiring simultaneous protection):		

7h. If the number of operating nozzles (see at 7f) is less than the number of nozzles on the system (see at 7e) explain the design rationale for this number of operating nozzles. For each compartment, state the number of installed heads, and the maximum number designed to operate for a fire in that compartment:
7i. If more than one nozzle model, type or size are used on the system explain why different nozzles are used and describe the measures taken that ensure the correct nozzles are fitted at each location (the nozzle selection should be consistent with the supporting fire test evidence (17)):
7j. Corrosion resistance and material compatibility. Give details of the materials used in the nozzles (metal type and classification). Confirm it is compatible with extinguishing agent and any chemicals it will be exposed to in the protected risk:

7k. 3-year functional watermist head testing requirement. BS 8489-12016 demands that the function of watermist heads is tested every 3-years (for sprinklers this is 25 years). This requirement demands the removal of 20 heads, or 1% of the system population, whichever is greater. Give details of:

How will the system stay in service following head removal?

What will be the cost associated with the purchase of replacement heads?

7l. In the event of the system manufacturer ceases trading, has the resupply of parts that might need replacing (following system operation, damage, or failed test) that are specific to the certification of the system (such as the watermist heads [3-years]) been considered and a plan for this eventuality made?

[Note: in sprinkler systems the heads are interchangeable between manufacturers' products and the approvals / certification of the system can be retained]

8. Extent of protection	
	Delete as applicable
8a. Is the property fully protected by water mist?	Yes / No
8b. Are all roof, ceiling and floor voids fully protected?	Yes / No
If the answer to either question is “No”, give details of the unprotected spaces at 10a and 10i	
8c. If there are any unprotected parts of the property, who has taken the responsibility for the decision not to protect these parts (Name(s) and Company name(s))?	

9. Building use
What is the intended use(s) of the building? (i.e., school, factory, warehouse, shop(s), offices, mixed use (specify), etc.):

10. Compartment / room use			
In the following sections, please give details of the occupancy of each room or compartment within the property including any unprotected parts: e.g. school class room, office, computer room, atria, laboratory, storeroom, stockrooms or cupboard etc.			
10a. Individual room or enclosure description. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here):	Room dimensions (W x D x H) in m	Protected by Water Mist (delete as appropriate)	Protected by other active suppression systems (delete as appropriate)
		Yes / No	Yes / No
		Yes / No	Yes / No
		Yes / No	Yes / No
		Yes / No	Yes / No
		Yes / No	Yes / No
		Yes / No	Yes / No
10b. Identify rooms with storage giving details of the materials, including any packaging, to be stored and the size of the room and contents. If storage is 'unknown' or 'uncontrolled' please list as such and state what assumptions have been made in this respect of this in determining protection requirements. Also provide details of storage height and storage method. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here).			
10c. Identify the room that has the largest quantity of combustible materials:			
10d. Identify the largest room or compartment volume:	dimensions (W x D x H) in m and Volume in m^3		
10e. Identify the room or compartment with the highest ceiling	dimensions (W x D x H) in m		

10f. Which room or compartment has the largest number of water mist nozzles and how many nozzles are there within the identified room or compartment? Cross refer to separate sheets or drawings if necessary. If used record the document number, title, issue number and date here:
10g. List and give brief details of all other rooms protected by water mist as specified in 10a. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here)
10h. Identify any rooms protected by other active fire suppression systems as specified in 10a, giving details of protection provided (e.g. sprinklers, fixed gas extinguisher system). (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here)
10i. Identify any areas, rooms or voids (including ceiling voids and floor spaces) within the protected property without any form of active protection as specified in 10a. Include justification for doing so. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here)

11. Ventilation and Interlocks	
11a. Provide details of ventilation systems (including smoke ventilation) present in water mist protected rooms or compartments. Will any ventilation system be operational during water mist system operation? Give details of any interlock controls. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here)	
11b. Possible natural and natural forced (wind) ventilation sources. Provide details of doors, windows, shutters, other openings, and controls upon their use.	
11c. Is any process equipment or machinery within the protected space?	Yes / No
If 'yes', provide a full description and describe any interlocks provided to enable the water mist system to perform optimally:	
Electrical power	Yes / No / NA
Gas supply	Yes / No / NA
Other fuels	Yes / No / NA
Forced ventilation (fans)	Yes / No / NA
Natural ventilation (doors and windows)	Yes / No / NA
Ductwork dampers and fire barriers (physical barriers to block fire spread)	Yes / No / NA
Conveyors (to stop spread of fire by transport systems)	Yes / No / NA
Rotating machinery	Yes / No / NA
Hot machinery	Yes / No / NA
Other _____	Yes / No / NA
Other _____	Yes / No / NA

12. System performance objective	
12a. What is the performance objective for the water mist system?	Please tick
Fire control	
Fire suppression	
Fire extinguishment	
12b. If the objectives differ in different compartments make this clear. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here)	
12c. If 'Fire Extinguishment' is not the performance objective describe below what additional actions are required to fully mitigate the fire threat and how this has been communicated to the end-user	

13. System operation duration and coverage
13a. What is the largest number of water mist nozzles that are assumed to be operating within the property during a fire (assuming a single ignition source) (Reference 7f)?
Explain how this number has been arrived at if the number of nozzles in any room or compartment exceeds the number assumed to be operating (Reference 7h). (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here):

13b. What is the duration of effective water discharge for the assumed maximum number of nozzles operating?[2]

	Delete as appropriate
13c. System activation. Confirm that the system uses thermally actuated nozzles (i.e. locally operated fusible element type nozzles) as its means of activation.	Yes / No
13d. Can the system be automatically activated by any means other than direct local operation of heads exposed to heat?	Yes / No
13e. Can the system be manually operated	Yes / No
13f. If 'yes' to 13c or 13d provide full details of the control and activation system including the RTI of the detection device	
13g. If 'no' to 13c ***Documents IQ 1 (Local Application) or IQ 2 (Building Compartment Protection – deluge closed head systems) are more appropriate to this application***	

14. Discharge at less hydraulically favourable location
14a. Identify the nozzles at the most and least hydraulically favourable locations from the water supplies and describe their liquid extinguishing media delivery rate during the discharge period in litres per minute[3]. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here):

[2] For pumped systems this might be determined by the size of water supply. For gas pressurised systems this might be the time from actuation until the pressure at the hydraulically least favourable nozzle falls below the pressure at which the system is proven by fire testing (17) to fulfil its performance objective (12)

[3] For pumped systems a single figure may be supplied for each nozzle. For gas propelled systems the flow profile for each nozzle is required over the effective discharge period.

15. Compensatory / trade-off and fire-engineered features
15a. Are any trade-offs / compensatory features proposed as a result of the presence of the system? If so, provide full details. Where part of a Fire Engineered solution please provide details of the Fire Strategy. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here): 15b. If there is a remit for this system to be '**equivalent**' to a BS sprinkler system – demonstrate how 'equivalency' for BOTH Performance (ability to put out fire) and Reliability (ability to actuate and perform optimally upon a fire starting over time) has been assured.

16. Compartment fire separation
16a. Provide details of building construction and fire protecting separation. Include details of fire resisting separation between protected and unprotected spaces if present. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here):

Commentary and Recommendations on fire test evidence:

- *Fire testing shall be undertaken by an independent test body.*
- *The test body shall be accredited by a national accreditation body for undertaking such work.*
- *Fire test evidence shall be presented in formal test reports issued by the independent test body.*
- *Test reports shall be presented in full.*
- *Testing shall be full-scale and matched to the nature of the risk to be protected and nozzle actuation method[4] (i.e. fat fryer testing is suitable for fat fryer protection, transformer testing is suitable for transformer protection).*
- *There shall be full traceability between fire testing and subsequent application (component specification, types, configurations and designs, system design, nature of risk).*
- *The limitations of testing shall not be exceeded in application (i.e. size and nature of risk, amount of fuel load, ventilation, inherent thermal energy in the risk, etc.).*

[4] Test evidence based on the performance of 'Deluge' system operation cannot be used in support of systems that used thermally actuated watermist heads.

17. Standards, Approvals, and performance evidencing
17a. Which specification(s) is the system designed to?
17b. Who is the provider of the installed system third party certification? (i.e. Lloyds, LPCB, Warrington, VdS, FM etc.)
17c. Fire test evidence – please provide the accredited third party test report(s) that demonstrate the system performance in a representative scenario for all parts of the water mist protected property[5] with reference to answers given in 10. **Specific consideration must be given to the proving of thermally actuated closed-head function when used in large arrays[6]** (List here by: issuing body, title, date, report number. Please provide copies of reports separately):

[5] With reference to i.e. system operating parameters, scale, the risk protected, obstructions, ceiling height, detection method, detection performance and system performance objective.
[6] Evidence should be provided of representative full-scale testing in a geometrically comparable space (up to a maximum area equivalent to that requiring protection by 36 heads arranged on a 6 x 6 grid), to evidence that head-skipping does not occur.

18. Pressure system regulations	Delete applicable
18a. Will the installed system require a written scheme of examination to comply with the pressure system regulations 2000?	Yes / No
18b. If 'yes' to 18a, have the system users'/owners'/responsible persons' been made aware of their responsibilities?	Yes / No
18c. If 'yes' to 18b, and the provision of a written scheme of examination is part of the system supply contract, provide details of the competent person(s) certifying the written scheme of examination and undertaking any identified examinations before the system is first used:	
Notes: The Pressure Systems Safety Regulations 2000 came into force on 21 February 2000. Users and owners of pressure systems are required to demonstrate that they know the safe operating limits, principally pressure and temperature, of their pressure systems, and that the systems are safe under those conditions. They need to ensure that a suitable written scheme of examination is in place before the system is operated. They also need to ensure that the pressure system is actually examined in accordance with the written scheme of examination. A written scheme of examination is a document containing information about selected items of plant or equipment which form a pressure system, operate under pressure and contain a 'relevant fluid'. The term relevant fluid is defined in the Regulations and covers compressed or liquefied gas, including air, at a pressure greater than 0.5 bar (approximately 7 psi). For further information see: HSE, 2009. *Safety of pressure systems - Pressure Systems Safety Regulations 2000 - Approved Code of Practice.* 4th edition. London, UK: HSE. HSE, 2002. *Guide INDG178 - Written schemes of examination - Pressure Systems Safety Regulations 2000.* 2nd edition. Suffolk: HSE Books. HMSO, 2000. *The Pressure Systems Safety Regulations SI 2000/128.* London, UK: Great Britain.	

19. Resilient design features	
19a. Please indicate below any design features in-built to prevent single-point failures within key system components from rendering the system ineffective (such as duplication and automatic reconfiguration):	
Loss of power (electric, stored gas etc.)	Yes / No / NA
Pump failure	Yes / No / NA
Failure of detection device	Yes / No / NA
Loss of water supply	Yes / No / NA
Failure of main isolation / actuation valve	Yes / No / NA
Failure of interlocks as specified in 11c	Yes / No / NA
Nozzle blockage via contamination of water supplies (i.e. particulates)	Yes / No / NA
Other _____	Yes / No / NA
Other _____	Yes / No / NA
Other _____	Yes / No / NA
Other _____	Yes / No / NA
If 'yes' to any of 19a please describe in full:	

20. Any other relevant data
20a. Details of all drawings, calculations and documents supplied with this questionnaire which have not already referenced in previous questions above, or that contain additional parts that require consideration. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number and date here):

21. Declaration	
I am authorised to represent the company identified below (21d) making this submission. I have supplied full and accurate information as required by this form.	
21a. Name (please print)	
21b. Signature	
21c. Date	
21d. Representing (Please print company name)	

Annex A: Minimum supporting documentation which must be supplied with the completed questionnaire

At least the documentation identified in A1 to A4 shall be provided with this questionnaire. Any drawings shall be at a scale of not less than 100:1:

A.1 A general specification for the system;

A.2 A block plan of the premises showing:

a) Compartmentation;
b) The installation and the details of the protected object, space or area;
c) The extent of the protection;
d) A cross-section of the protected object, space or area
e) Location and rating of fire boundaries.
f) Water supply location(s)

A.3 Design and operation manual for the watermist system.

A.4 The following documentation shall be provided to support the questionnaire as part of the design process.

A summary schedule, which shall include the following:

a) the name of the project;
b) drawing and document references including issue number, issue dates and titles;
c) the installation type(s);
d) control valve(s) details, including nominal diameter, and reference number(s)

e) the number of nozzles controlled by each control valve; and

Layout drawings of the water mist installation(s), the drawings shall include:

a) the north point indication;
b) the level of protection provided for each protected enclosure;
c) constructional details of floors, ceilings, roofs, partitions, exterior walls in close proximity to the protected object, space or area;
d) indication of obstructions which may adversely influence performance of water mist nozzles;
e) water mist nozzles;
f) the fire detecting means and their operating set point;
g) location and type of control valve sets;
h) fire alarms, flow alarms, sounders and alarm panel;
i) pressure switches;
k) locations and sizes of any subsidiary stop valves;
l) the drainage slope of the pipework;
m) the locations of all drain and test valves;
n) pipework and pipe fitting specifications and materials;
o) a key to the symbols used on drawings; and
p) a schedule of water mist nozzles, their fire detection means and the areas they protect.

A.5 Pipe work design

Details shall be provided which show how the pipe sizes will be determined;

If the pipe sizes are determined by calculation, provide:

a) the calculation method or computer programme name;
b) the date of the data provided;
c) the internal diameter of all pipes ;
g) water mist nozzles;
h) location and type of control valves;
i) flow alarms, sounders and alarm panel;
j) pressure switches;
k) locations and sizes of any subsidiary stop valves or selection valves;
l) the drainage slope of the pipework;
m) the locations of all drain and test valves;
n) a key to the symbols used on drawings.

A.6 Water supply drawings

The drawings shall show the water supplies and the pipework up to the control valves. The position of any stop valves, non-return valves, pressure reducing or controlling devices, water meters and any connections for other services shall be shown.